

Pest Management Grants FINAL REPORT

March 31, 2000

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Contract Title: Integrated Apple Production (IAP) Demonstration Project

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Contractor Organization: University of California Cooperative Extension
Division of Agriculture and Natural Resources

Prepared for the Department of Pesticide Regulation

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Growers:	Richard Chavez	Chavez-Garrels Orchard
	Mark Dwelley	Eden Plains Orchard
		Delta Orchard (Mating Disruption Comparison)
	Soupy Lopez	Lopez-Garrels Orchard
	Elgin Martin	Airdrome Orchards
	Walt & Jim Moffat	Hobson Orchard
	Ron Nunn	Jacuzzi Hills (Mating Disruption Comparison)
		Jacuzzi Flats
		Rosie Hills (Mating Disruption Comparison)
		Rosie Flats
		Neroly Orchard
		Little Garrels Orchard

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ABSTRACT

Agriculture-urban interface problems have led to an interest in adopting a reduced risk pest management program in Contra Costa County orchards. The use of pheromone mating disruption would allow apple growers to significantly reduce the use of controversial materials, however, the cost and risk of such a program has been prohibitive. The IAP program was developed to offset these factors by providing a cost share for the mating disruption product and monitoring assistance.

Nine orchards (172.5 acres) participated in the IAP program 1999. Three conventional orchards (65 acres) and three orchards in the 2nd year of mating disruption (72 acres) were used as comparisons to evaluate program performance. An IPM plan was developed for each orchard that emphasized the use of reduced risk materials, with mating disruption being a key component in all plans.

The amount of bearing apple acreage in the county using mating disruption increased from 20% to 30%. Pest damage averaged 1% and was acceptable for a first year program. In the IAP orchards, the use of reduced risk materials increased by 34% and targeted materials decreased by 30%. The use of targeted materials should continue to decrease in future years as pest pressure declines, beneficial insect activity increases and reduced risk materials and methods are adopted.

The pest management costs for orchards in the IAP program (with cost share) were 28% higher than for orchards using conventional pest management practices. Without the IAP cost share, the reduced risk practices would have cost 62% more than for a conventional program. Costs for the IAP approach are expected to decline over the next few years as the rate for the mating disruption product is reduced and fewer primary and secondary pest sprays are required.

EXECUTIVE SUMMARY

The Integrated Apple Production (IAP) project began in 1999 as an effort to reduce the use of broad-spectrum insecticides in apple orchards by encouraging the use of proven, softer IPM practices. The impetus for the project was two fold: to help growers address the potential loss of pesticides posed by the implementation of the Food Quality Protection Act (FQPA) and to reduce pesticide spray and drift problems in rapidly urbanizing eastern Contra Costa County. The California Department of Pesticide Regulation (CDPR) provided a \$30,000 grant to support the transition to the reduced risk IAP approach.

Nine orchards (175 acres) participated in the IAP project in 1999. A management team comprised of participating growers, PCA's, field scout, and project coordinator met on a monthly basis to evaluate progress and problems. The key to the reduced risk IAP approach was the use of Mating Disruption (MD) to control codling moth (CM), the principal pest in apple production. A careful monitoring program was established to evaluate the need for supplemental CM controls: traps were set out at a rate of 1 trap every 3.5 acres and checked weekly. Fruit damage was evaluated at the end of each generation and at harvest. The CDPR funds were used to hire a part time field scout to assist with monitoring and provide a 50% cost share for the MD product to bring the cost of the IAP program closer to conventional costs. Three conventional orchards and 3 orchards in their 2nd year of MD were monitored as comparisons.

The IAP program increased the use of mating disruption in the county from 20 to 30% of the bearing apple acreage. In this first year, all orchards used a full rate of mating disruption and a full coverage

organophosphate (OP) spray for the first generation. If monitoring indicated a need, orchards received an additional full coverage or border spray for later generations. Four orchards with the lightest pressure received no additional codling moth sprays and 5 orchards were able to reduce the rate of MD product in the later half of the season. CM damage averaged 1% in all the IAP orchards by season's end but ranged from 0 to 3.4% in individual orchards. OP sprays used for CM control were reduced by 60%.

Secondary pest outbreaks (aphid, leafhopper, mites, leaf miner) were expected due to the CM cover spray(s). Most orchards were able to successfully control these pests with narrow-spectrum materials (Provado, Agri-mek, Pyramite, Kelthane). By season's end, the IAP orchards had reduced all OP and carbamate (C) sprays by 30%; dormant and thinning sprays accounted for most of the OP/C use not related to CM. The use of reduced risk materials increased by 34%.

Overall pest management costs for the first year IAP program were 28% higher than a conventional program (\$347/A vs. \$270/A). Without the IAP cost share, this reduced risk program would have been 62% higher (\$440/A). The 2nd year MD program cost 28% more than a conventional program (\$347/A) but would have cost about the same with an IAP cost share (\$264/A). In future years, as the codling moth population comes under control, orchards should be able to reduce costs by reducing the rate of MD product and sprays. Where supplemental CM sprays are needed, less disruptive materials (Confirm, Success) may be substituted for the broad-spectrum organophosphates. As broad-spectrum insecticides are eliminated, newly imported parasites (*Mastrus spp.*) will be released to assist with codling moth control and further reduce the need for supplemental sprays. Secondary pests are expected to be kept in check by cultural, biological or less disruptive chemical controls (Provado, Agri-mek, soaps, oil).

Grower interest in converting more acreage into the IAP program is high. The primary limitation is the availability of funds to assist growers with the transition. Additional funding has been obtained from UC SAREP's BIFS program for this purpose. The combined IAP and BIFS acreage for the 2000 season will be about 640 acres, a 73% increase over last year and totaling 42% of the bearing acreage in the county.

Information about the IAP program and the reduced risk pest management approach has been extended to growers, pest management professionals, university researchers/educators/students and the general public through workshops, presentations, and publications.

BODY OF REPORT

Introduction: Rapid urbanization around apple orchards in Contra Costa County has lead to agricultural-urban interface problems with the use of pesticides being the primary concern. The primary goal of this project is to reduce the use of controversial, broad-spectrum insecticides in apple orchards by encouraging the use of proven, softer IPM practices. The key to a softer pest management approach in apples is to adopt a mating disruption program for codling moth, the principal apple pest. Most other insect pests can be controlled by narrow spectrum and/or reduced risk materials and/or beneficial insects if the disruptive codling moth sprays are eliminated.

Pheromone mating disruption (MD) has been shown to work well in Contra Costa County as well as in other locations in California and the Northwest. It has not been as widely adopted in California as it has been in the Northwest. The primary barrier to adoption in California has been the increased cost of

this approach, especially in the initial transition years, due to our longer season and higher codling moth pressure.

In addition to the added cost, this approach is a bit riskier, requires more intensive monitoring and is most effective on larger acreages. As a result, it has primarily been used in either organic systems or orchards where organophosphate (OP) resistance (and control failure) has been a significant concern.

The IAP program was developed to offset the increased risk and expense of a mating disruption program and provide a forum for exchange of alternative practices information. Program funds were used to provide a 50% cost share for the mating disruption product and provide monitoring assistance. The 50% cost share brought the cost of a California MD program in line with that for northwest growers. Even with the cost share, the IAP program was still expected to be a bit more expensive than a conventional program in this first year. However, as the codling moth population comes under control in subsequent years, the cost is expected to approach that of a conventional program as the need for supplemental and secondary pest sprays and the rate of pheromone product are reduced.

Materials and Methods:

Objective 1: Establish IAP and Conventional Comparison Orchard Sites.

Project funds allowed for the recruitment of approximately 175 acres into the IAP program. It was originally intended that each IAP orchard would be paired with a Conventional Comparison orchard. However, as representative comparison orchards were not available for all sites, it was decided that comparing the 1998 pest management records for all IAP sites (under conventional management practices) with 1999 records (under IAP management practices) would give a more accurate reflection of program effect. In addition, comparison data on crop damage, beneficial insect activity, pesticide use, and economic information were collected from three nearby orchards, farmed by IAP growers, which had been put into a MD program the previous year (MD2). These orchards provided program participants with an idea about what to expect in their 2nd IAP season. Pesticide use and economic data were also collected for three other nearby orchards, farmed by IAP growers, which were managed conventionally.

A Management Team was formed to keep track of program progress and to share related information. The team included the IAP Project Coordinator (UC Farm Advisor), the IAP field scout, the Pest Control Advisors for the IAP sites and the IAP growers. The team met on a monthly basis during the course of the growing season to exchange information.

An Advisory Committee of UC experts was established to assist the Management Team in the development of an IAP program. They provided information as needed, over the course of the growing season.

Business agreements were drawn up by the UC Contacts and Grants Office for each grower. They identified the IAP orchards and outlined the responsibilities of both the grower and the Project Coordinator/UC in the IAP program. Growers purchased the MD product and submitted a bill to the project coordinator for reimbursement of 50% of the cost of the product.

Objective 2: Establish an area-wide approach to codling moth mating disruption

Mating disruption is most effective on larger acreages which have a proportionally lower amount of vulnerable edges. The IAP sites were selected to expand existing MD blocks, or to group smaller orchards into a larger blocks, or for their potential to expand to adjacent blocks in future years as well as for grower interest in IAP practices.

A part time field scout was hired to assist with the monitoring program. In cooperation with site PCA's, bucket traps were set out at a rate of 3.2 traps per acre. They were placed in a rough grid pattern throughout each orchard, making sure to have any sensitive areas (edges, hilltops, narrow strips) covered. Four-fifths of the traps were baited with 3-mg gray septa which were changed every 6 weeks. These were used to indicate problem areas where the pheromone was not working well. One-fifth of the traps were baited with 10 mg red septa to help monitor codling moth flights and time sprays if needed. These lures were changed every 2 weeks. The field scout checked traps on a weekly basis and provided the PCA's with trap counts the same or the next day. The PCA's checked traps on an alternate day of the week when they felt it necessary, and the field scout incorporated that data into the IAP database.

After each CM generation, 1000 fruit in each orchard were examined in order to determine the extent and location of any CM damage from the previous generation. Any damaged fruit were cut open to determine the age of the worm and when the egg laying was most likely to have occurred to provide information about conditions during the MD breakdown period. Decisions as to the need for supplemental sprays for the next generation were made based on these counts.

Objective 3: Develop an IPM plan for each orchard

The project coordinator met with the PCA and/or grower of each IAP orchard to collect baseline data about the orchard, review past pest management problems and practices and develop a plan to meet the goals of the IAP program. The form used to collect orchard histories and develop the IPM plan is included as Figure 2. The use of biological and cultural controls and non-disruptive spray materials were encouraged to supplement MD and control secondary pests. IPM options were reviewed and discussed at the monthly Management Team meeting.

In mid summer, a detailed count of the secondary pests (aphid, leaf hopper, and leaf miner) and beneficial insect activity was done. During subsequent CM fruit examinations, informal evaluations were done for secondary pests.

Pesticide use records and product cost for all IAP orchards for 1998 and 1999 (to date) were collected from the orchard PCA after the last insecticide spray for the season.

Results:

Objective 1: Establish IAP and Conventional Comparison Orchard Sites.

Nine orchards were selected based on their suitability for MD, their proximity to established MD orchards, their potential for MD expansion in future years and the willingness of growers to adopt a reduced risk approach. The nine IAP orchards (172.5 acres), the three MD comparison orchards (72 acres), and all other conventional apple orchards in the area are shown in Figure 1. All IAP orchards remained in the program throughout the year and growers intend to continue with the program next season. Three of the growers intend to expand the IAP approach to some of their other acreage next in the 2000 season.

Objective 2: Establish an area-wide approach to codling moth mating disruption

The IAP program increased the use of MD from 20% (311 acres) to 30% (483.5 acres) of the bearing apple acres in Contra Costa County.

All IAP and MD2 orchards used a full rate of MD product for the first application. Five of the IAP orchards and all the MD2 orchards were able to successfully reduce the rate in the 2nd application. This exceeded original expectations.

All IAP and MD orchards applied supplemental sprays based on monitoring data. These are outlined in Table 1 and detailed in Table 7. Four of the IAP orchards applied only 1 supplemental CM OP spray; three applied 1 full and 1 border CM OP spray; two applied 2 full and 1 border CM OP sprays.

The codling moth (CM) damage is presented in Table 1. Average CM damage by the end of the season was 1% in both IAP and MD2 orchards. Damage in conventional orchards is typically below 1% in this county. The damage ranged from 0-3.4% in individual IAP orchards and 0-2.9% in MD2 orchards. It typically occurred, as expected, along the edges, hilltops, or in grafted trees that had not yet developed a full canopy. Although, this level of damage is higher than would typically occur in a conventional system, it is not unacceptable for an early MD program providing that the populations can be kept in check in the problem orchards next season.

The IAP trap counts for each flight period are included in Table 2. The conventional trap counts are graphed in Figure 3 for comparison. The monitoring traps did not perform as well as expected. Some orchards with little or no trap catch sustained unexpected damage where others with relatively high trap counts sustained none. The 10-mg traps did not seem to be a reliable indicator of flight patterns as they were catching a similar level of moths as the lower load traps. Improvements to the IAP trapping program (trap design and/or lure changes) are being considered for next season. Because of the difficulty in interpreting trap data (as well as irrigation and harvest schedules) some orchards sustained higher damage than was expected. Improvement in next years trapping will help to remedy this.

Objective 3: Develop an IPM plan for all pests

As all orchards but one MD2 orchard received at least one full CM OP cover spray, secondary pest outbreaks and the need to control them were expected. A season long summary of all pest damage and a materials summary are presented in Table 6 and 7, respectively. Most IAP orchards and all MD2 orchards were able to follow the reduced risk IPM plan outlined at the beginning of the season. Only 3 orchards needed a single application of something other than a reduced risk (RR) material to control secondary pests.

Seven of the nine IAP sites had aphid populations high enough to require spraying and all used Provado (a narrow spectrum, reduced risk material) to successfully control them (see Table 3). The orchards with the highest aphid populations also had the highest beneficial insect activity but this was not sufficient for control with this year's extended cool weather. Lacewings and aphid flies were in highest abundance. This was the first time that the aphid fly had been observed in this county! Parasitic wasps and lady bird beetles, the classic aphid biological control agents, were much less evident.

Tentiform leaf miner (TLM) has natural control agents which are easily disrupted by the 1st flight CM spray. As all the orchards but one applied this disruptive spray, most chose to add a narrow, spectrum,

preventative spray (Agri-mek) to control both leaf miner (TLM) and mite (see Table 4). One IAP orchard that did not use this preventative spray eventually required a mid season disruptive spray to prevent serious damage. The MD2 orchard that only received a border spray for the first CM flight did not apply any TLM materials and the pest was successfully kept in check by naturally occurring parasites.

Mites were not routinely included in our detailed monitoring but informal evaluations were made during the CM fruit damage counts (see Table 6). Most orchards received a well timed, mid season, narrow spectrum mite spray and did not experience problems. One IAP orchard was unable to apply a timely spray due to harvest considerations and developed high mite populations and leaf drop. We will explore the use of beneficial mite releases to address this problem the next season.

Leaf hoppers (LH) were moderate to high in two IAP orchards in mid summer. Narrow spectrum or RR materials (Pyramite and Provado) controlled these well. Three other IAP orchards developed high populations close to harvest. No spray was applied in these orchards as it was too late for the LH to do serious damage and it was hoped that the high population would encourage a high level of biological control for next season.

The volume of all pest management materials, organophosphates/carbamates (OP/C), and reduced risk (RR) materials which were used in the different systems in 1998 vs. 1999 are shown in Figures 4, 5 and 6, respectively. The IAP orchards which transitioned from a conventional program (1998) to MD (1999) showed a 13% increase in total materials, a 34% increase in RR materials and a 30% decrease in OP/C use. The MD2 orchards had a 5% increase in all materials, a 20% increase in OP/C, and a 6% increase in RR materials in comparison with the previous year. The increase in OP/C is due to an increase in the number of Sevin (carbamate) sprays applied for fruit thinning, not pest management; the OP sprays were actually reduced 22% from 1998 and were 65% of the conventional use for 1999. The conventional orchards used 44% more OP/C, 64% less RR materials and 41% less of all pest management materials than the IAP or MD2 orchards. However, the CM pressure in 2 of these orchards was reduced due to proximity to MD blocks and young age, therefore a less intensive CM spray program than is typical was used.

As predicted, the cost for a first year MD program was 62% higher (\$435-440) than the conventional program (\$270-274) (see Figure 7). With the IAP cost share, the first year MD program was only 28% higher (\$347) than the conventional program the previous year. The cost of MD dropped by 20% in the 2nd year as a result of fewer CM sprays and a reduced rate for the second MD application. If we had provided an IAP cost share to these 2nd year orchards, their cost would have been equivalent to a conventional program. As we move into the 3rd and 4th year of mating disruption we expect the cost to continue to decline.

Discussion:

The mating disruption acreage in the county was increased by 10%. The grower interest in converting more acreage into the IAP program is high. The primary limitation is the availability of funds to assist in the transition. An additional \$140,000 has been obtained from the UC SAREP BIFS program to help move more acres into a RR program over the next 3 years. For the 2000 season, 204 acres will be enrolled in the IAP program, 460 acres will be enrolled in the BIFS program and 42% of the bearing pome fruit acreage in the county will be using MD and RR pest management practices.

OP/C use declined in the IAP acreage by 30% in the first year of MD and OP use decreased by 65% in the 2nd year of MD. The overall reduction in the use of OP's as CM sprays went as anticipated. However, the use of Diazinon for dormant sprays and rosy apple aphid control and Sevin for fruit thinning kept the combined OP/C use higher than expected. Alternatives to the dormant OP and thinning sprays are being actively researched in California and the northwest and will be incorporated as developments occur. A new RR aphid material (Aphistar) was tested in this county this year and may be used as a replacement for Diazinon if registration is received by next season. The IAP and MD2 orchards with the lowest CM pressure will be in a position to replace the supplemental CM OP sprays with 2 new RR materials (Confirm, Success) next season. Related research in this county and elsewhere have shown these to be effective CM materials in low pressure situations. In addition, experimental CM parasites from the UC Berkeley lab of one of our Advisory Committee member, Dr. Mills, were released last Fall in two 2nd year MD orchards that are positioned to remove broad spectrum materials in their 3rd year (the 2000 season).

IAP growers sponsored two field trips to their orchards during the growing season. In mid summer, a group of teachers visited the IAP orchards and learned about the program as part of our Farm Bureau's Agriculture in the Classroom program. In September, a Field Entomology and a Biological Control class from UC Berkeley visited the IAP orchards to learn about apple pest systems and collect insects.

A Regional IAP Workshop was held on November 19th in Brentwood to share information about the IAP program and RR practices with others. As part of this workshop, 9 exhibitors participated in a small trade show featuring RR products. Twenty six pest management professionals and 24 growers attended the workshop.

A poster titled "Integrated Apple Production: Meeting the Challenge of the FQPA" was presented at the California Association of Pest Control Advisors (CAPCA) annual meeting October 17-19. This conference had over 1000 participants.

Two presentations on the IAP program were given at the Contra Costa County Private Applicator Continuing Education Workshops on December 4th and 16th. Seventy-five growers attended the two classes.

A presentation on "Alternative Codling Moth Control Strategies" which described the IAP reduced risk approach was given at the Ca. Apple Symposium on February 22, 2000 in Stockton. 175 members of the apple industry attended the symposium which was sponsored by the Mid-Valley Apple Association and UC Cooperative Extension.

A 30 minute presentation on "Integrated Apple Production" was made as part of a larger session on Reduced Risk Fruit Production at the Pomology-Extension Continuing Conference at UC Davis on March 23rd, 2000. This is an annual conference for all UC faculty, specialists and farm advisors working with fruit and nut crops.

Two articles were published in trade journals:

Caprile, Janet. *New Millennium Apple Pest Management*. California Grower, January 2000, p.10.

Caprile, Janet. *Integrated Apple Production: Meeting the Challenge of the FQPA*. Tree Fruit Magazine, March 2000.

Summary and Conclusions:

Agriculture-urban interface problems have led to an interest in adopting a reduced risk pest management program in Contra Costa County orchards. The use of pheromone mating disruption would allow apple growers to significantly reduce the use of controversial materials, however, the cost and risk of such a program has been prohibitive. The IAP program was developed to offset these factors by providing a cost share for the mating disruption product and monitoring assistance.

Nine orchards (172.5 acres) participated in the IAP program 1999. Three conventional orchards (65 acres) and three orchards in the 2nd year of mating disruption (72 acres) were used as comparisons to evaluate program performance. An IPM plan was developed for each orchard that emphasized the use of reduced risk materials, with mating disruption being a key component in all plans.

The amount of bearing apple acreage in the county using mating disruption increased from 20% to 30%. Pest damage was acceptable. The use of reduced risk materials increased by 34% and the use of targeted materials decreases by 30%. This amount should continue to decrease in future years as pest pressure decreases, beneficial insect activity increases and reduced risk materials and methods are adopted.

The cost of the first year IAP program was 28% higher than a conventional pest management program. This is expected to decline over the next few years as the rate for the mating disruption product is reduced and fewer primary and secondary pest sprays are required.

The grower interest in expanding this program is high. As the rate of pheromone is reduced in the IAP orchards in upcoming years the available cost share funds will be used to incorporate new acreage into the program. An additional \$140,000 has been obtained from UC SAREP to support an expansion of a reduced risk pest management program over the next three years. Information about the IAP program and the reduced risk pest management approach has been extended to growers, pest management professionals and university researchers/educators/students and the general public through workshops, presentations, and publications.

APPENDICES

Contra Costa County Apple Acreage

Total Bearing Acres: 1590

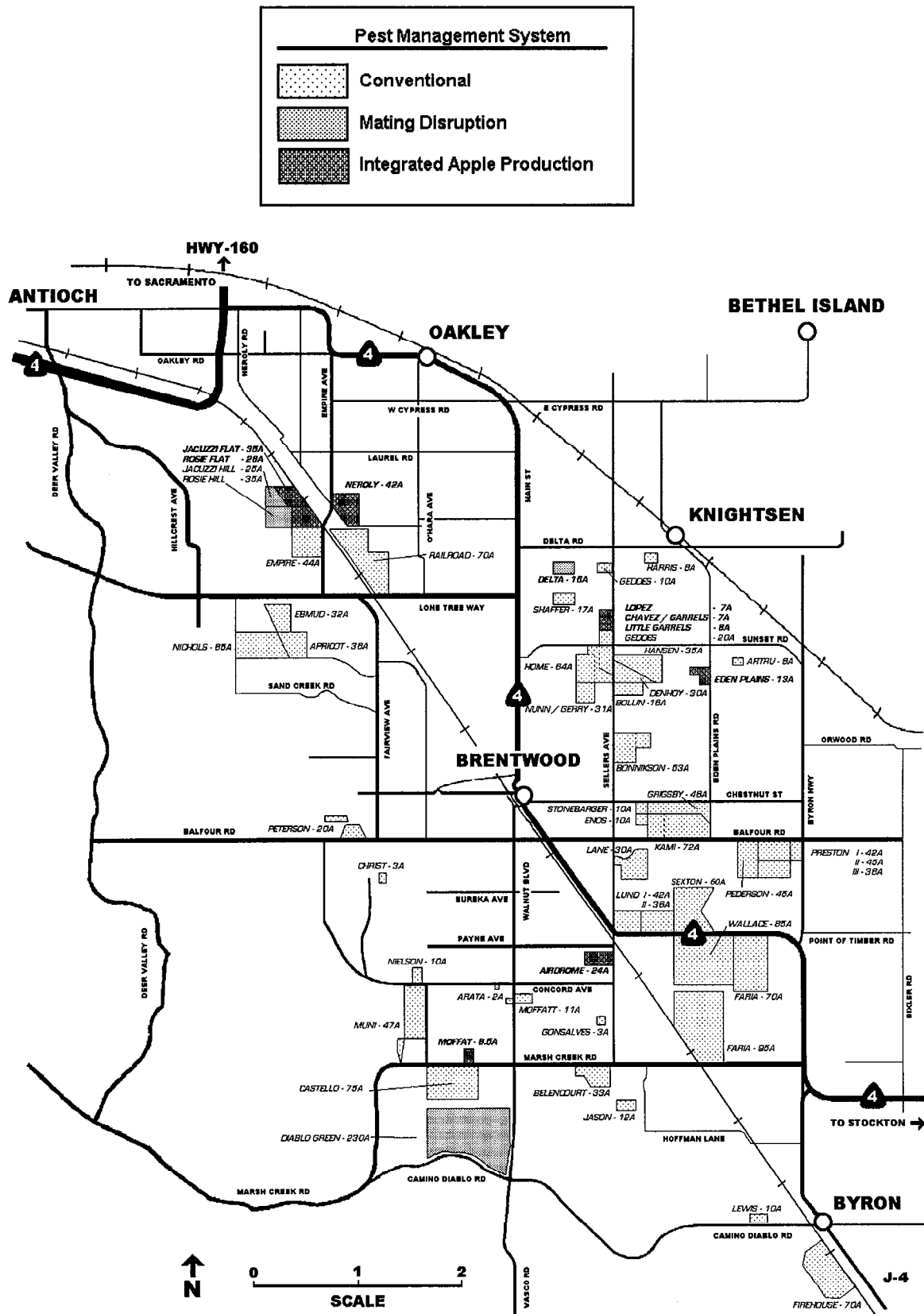


Figure 1. Map of Contra Costa County apple orchards

IAP ORCHARD - IPM PLAN

Date:

Grower:
Orchard:
Age:
Varieties:
Rootstock:
Spacing:
Tree height:
Training System:
Trellis:
Irrigation System:
Orchard Floor Management:
Thinning practices:
Vertebrate Pests: gophers, squirrels Management:
Nutritional Problems: Bitter pit, Zn, NPK, B Management:
Scab/Mildew: Past history:
Current Plan:
Fireblight: Past history:
Current Plan:
Other Diseases: ORF, R/C rot Past history:
Current Plan:

Figure 2. Form for developing an IPM plan (page 1 of 2)

Codling moth
Past history:
Current Plan:

Aphid: RAA, WAA, GAA
Past history:
Current Plan:

TLM:
Past history:
Current Plan:

Leaf Hopper:
Past history:
Current Plan:

Leaf Roller, etc: OBLR, GFW, WTM, OLR
Past history:
Current Plan:

Mites: ERM, WSM
Past history:
Current Plan:

Other Insect Pests : scale, lygus, stink bug, thrips
Past history:
Current Plan:

Notes:

Figure 2. Form for developing an IPM plan (page 2 of 2)

Figure 3. 1999 codling moth flight for conventionally managed orchards in Brentwood, CA

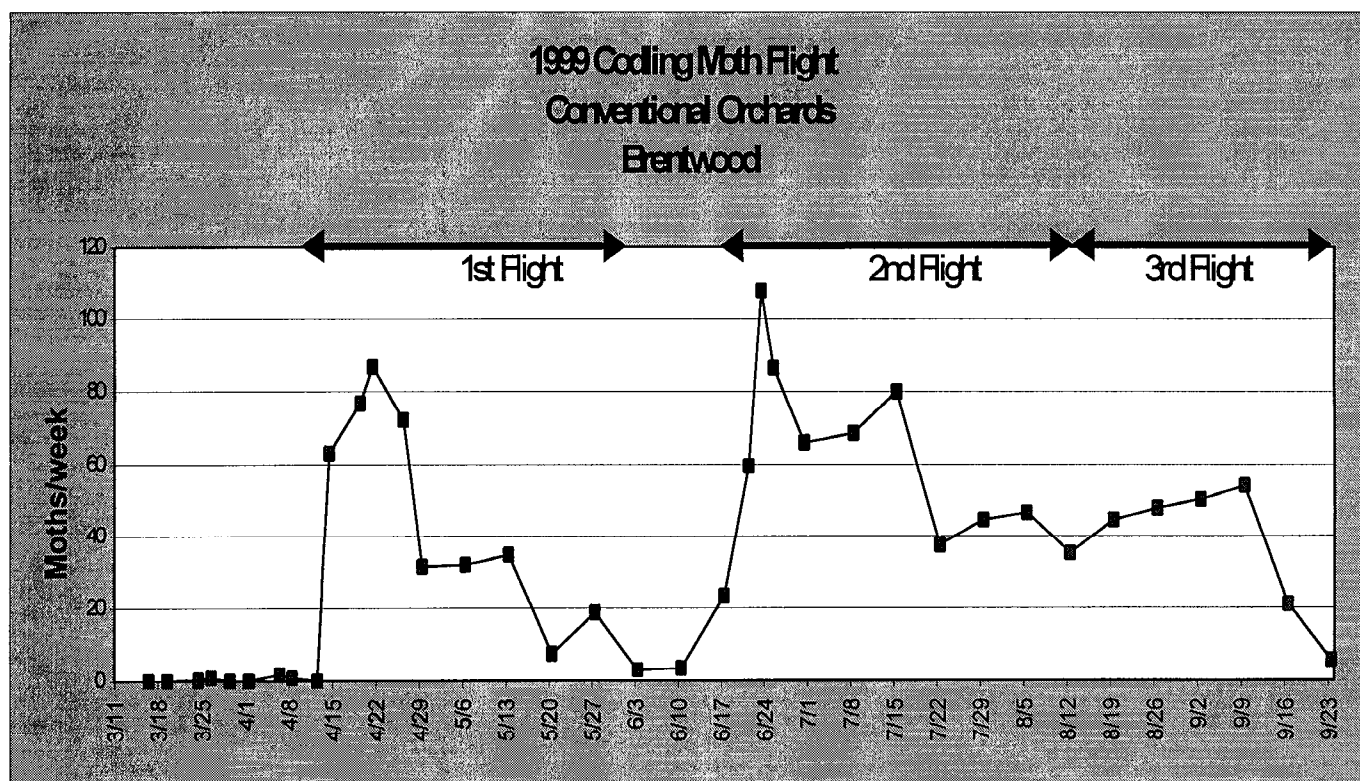


Figure 4. Pounds per acre of all pest management materials used by each management system

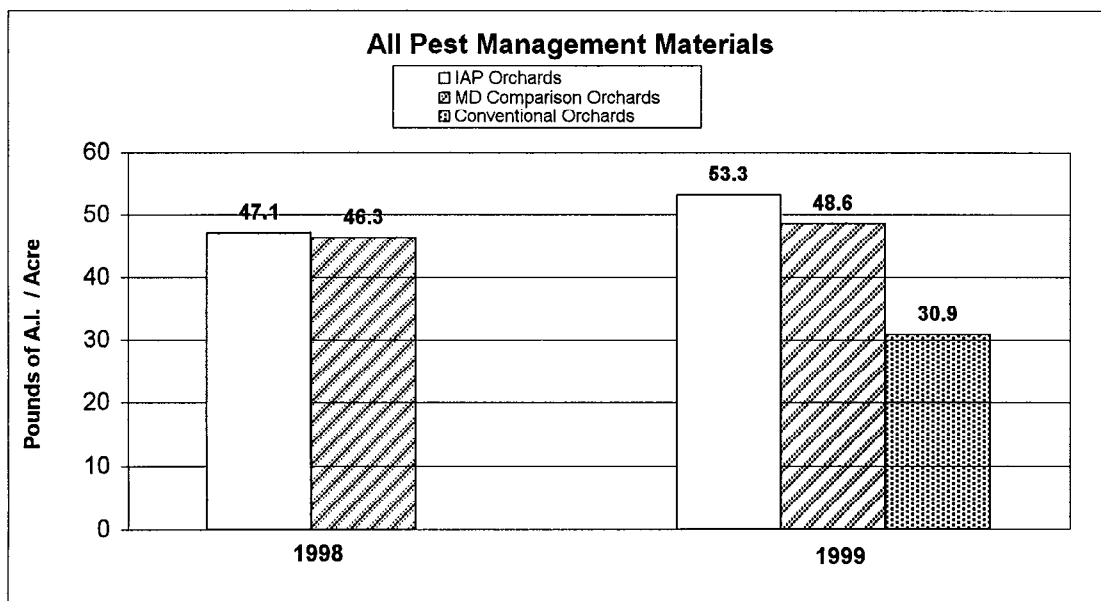
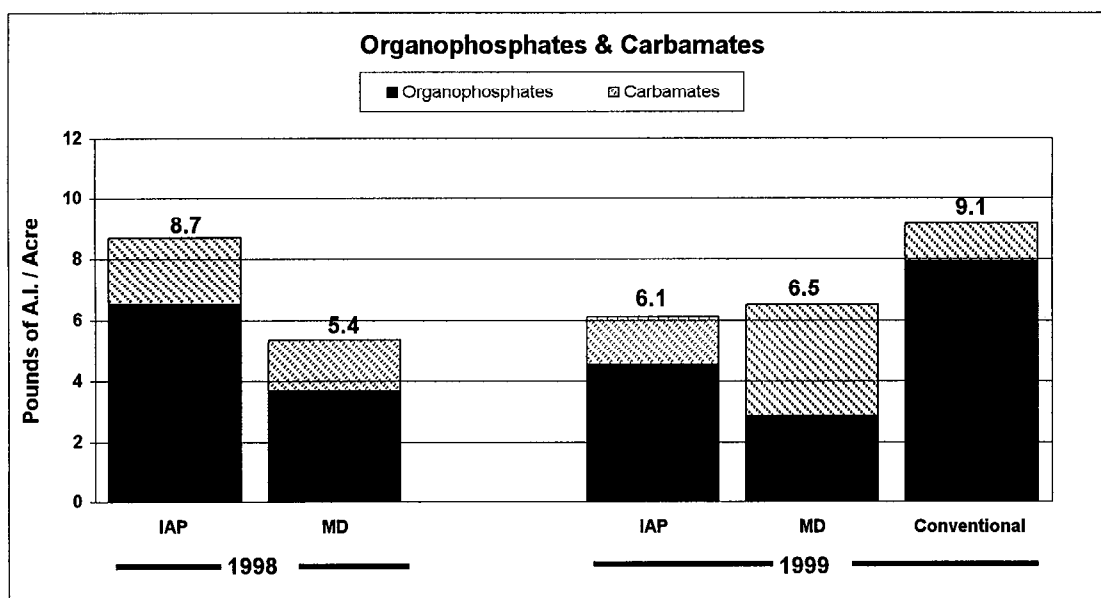


Figure 5. Pounds per acre of all organophosphates and carbamates used by each management system



Note: 1988 IAP orchards farmed conventionally, MD under 1st year of MD
 1999 IAP orchards under 1st year of MD, MD orchards under 2nd year of MD

Figure 6. Pounds per acre of all reduced risk pest management materials used by each management system

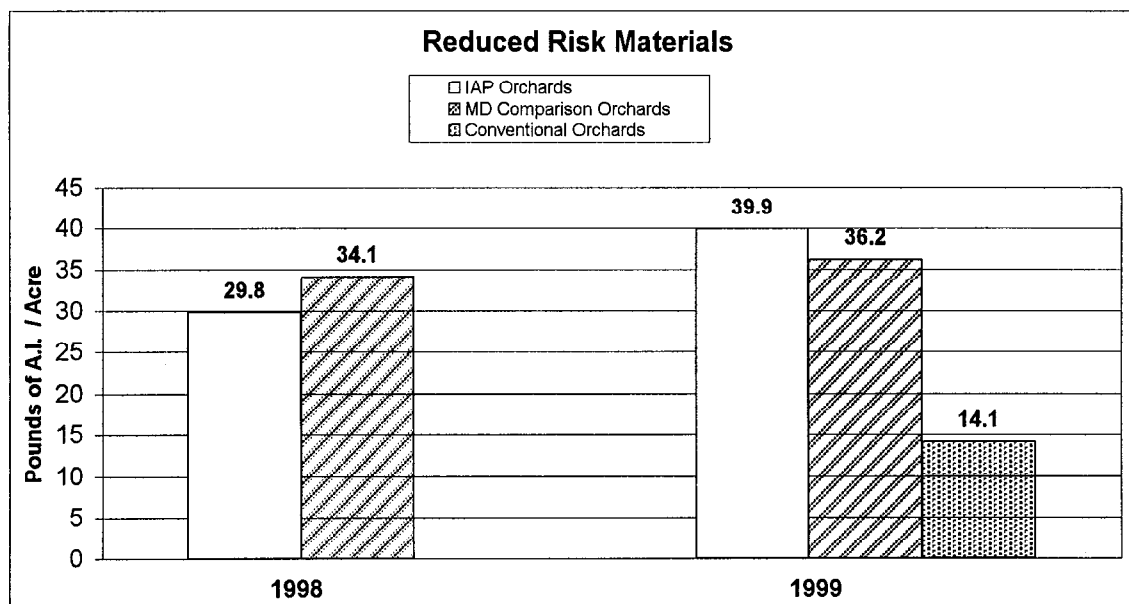
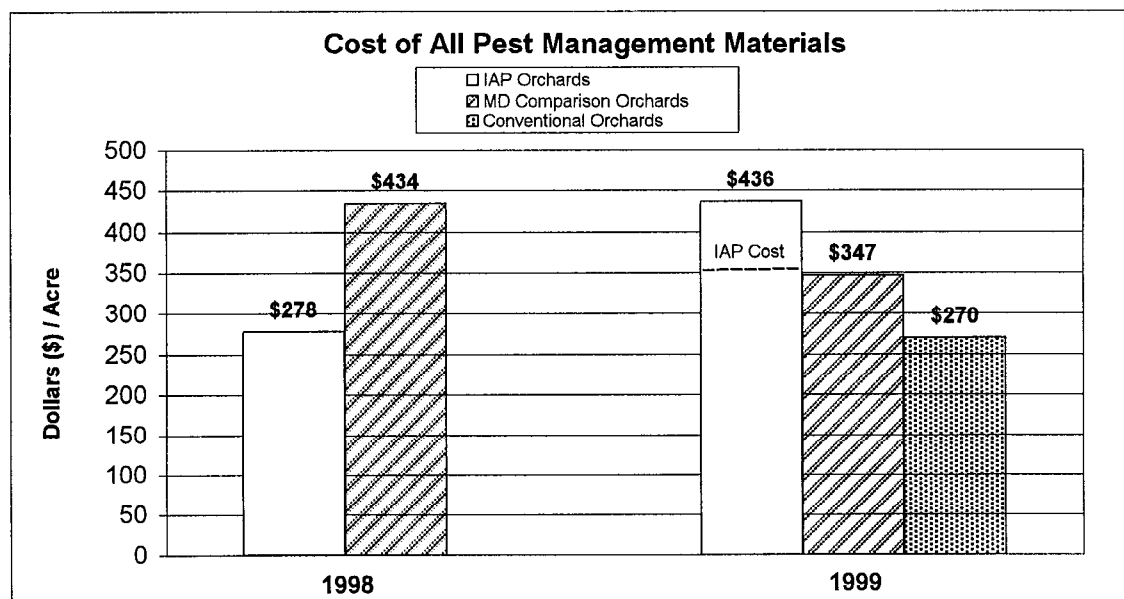


Figure 7. Cost of pest management materials used by each system



Note: 1988 IAP orchards farmed conventionally, MD under 1st year of MD
 1999 IAP orchards under 1st year of MD, MD orchards under 2nd year of MD

Table 1. Summary of codling moth damage and sprays in the nine IAP orchards and the three orchards in their second year of pheromone mating disruption (MD)

			Codling Moth Damage							
IAP ORCHARDS	Acres	Variety	1st Generation ¹		2nd Generation ²		Harvest Generation ³		Location of damage	CM sprays
			% damage	Age of damage ⁴	% damage	Age of damage	% damage	Age of damage		
Jacuzzi Flats	35	Fuji, GS	0.0		0.2	1 old 1 new	0		N & E edges	1st: full cover 2nd: border
Rosie Flats	28	Fuji, GS	0.0		0.0		0.02	1 old 1 new	W & E edges	1st: full cover 2nd: border
Neroly Road	42	GS, Fuji	0.7	6 old 1 new	2.6	18 old 2 new	0.8	5 old 3 new	throughout but more on W & S edges	1st: full cover-air 2nd: border 3rd: full cover-air
3 Garrels Gala Fuji Pink Lady	22	Gala, Fuji, Pink Lady	0.8	6 old 2 new	0.7	5 old 2 new	2.2		N edge damage spread into the entire Lopez/Chavez block N of drive by harvest	1st: full cover 2nd: border
							3.4	14 old 20 new		
Eden Plains	13	Fuji, ⁵ others	0.2	2 old	0.6	1 old 3 new	1.6	8 old 8 new	along edges	1st: full cover
Airdrome Gala Fuji	24	Gala, Fuji	0.0	0	0.0		0.0			1st: full cover
							0.0			
Moffatt	8.5	Fuji, GS	1.1	9 old 2 new	2.0	19 old 1 new	1.2	10 old 2 new	throughout	1st: full cover 2nd: border 3rd: full cover
Total/Average	172.5		0.4		0.9		1.0			
MD2 Orchards										
Jacuzzi Hills Granny Smith Fuji	25	Fuji, GS	0.0		0.0		0.6	7 old	W edge	1st: border 2nd: border
							0.02	2 old		
Rosie Hills Granny Smith Fuji	35	Fuji, GS	0.0		1.3	4 old 9 new			mostly along N & W edges & hilltop in middle	1st: full cover 2nd: border
							2.9	13 old 16 new		
							0.4	1 old 3 new		
Delta Road Granny Smith Fuji Pink Lady	12	GS, Fuji, Pink Lady, 2 others	0.0		1.3	6 old 7 new			S half of main block (grafted section); W & S edge of Pink Lady block	1st: full cover 3rd: 1/3 sprayed
							1.8	5 old 3 new		
							0.0			
Total/Average	72		0.0		0.9		1.0			

Notes:

¹ 1st generation evaluation : 6/24-7/7 @ 1010-1294 DD

² 2nd generation evaluation: 8/11-8/13 @ 1956-1992 DD

³ Gala harvest evaluation: 7/27 @ 1689 DD; Granny Smith harvest evaluation: 9/3-9/8 @ 2447-2553; Fuji harvest evaluation: 9/10-9/22 @ 2591-2804

⁴ Old damage: no worms present (emerged or dead); New damage: worms present

Table 2. Summary of codling moth trap counts in the nine IAP orchards and the three orchards in their second year of mating disruption (MD)

IAP Trap Counts -- Comparison by Flight

System	Location	Trap #	Block	Orchard	Trap Code	mg	Cumulative			Total
							Flight 1	Flight 2	Flight 3 To Date	Year to Date
MD2	Jacuzzi Hills	1	1	JH	S W	3	1	1	0	2
		2	1	JH	W	10	0	0	2	2
		3	1	JH	N W	3	18	8	4	30
		4	1	JH	S E	3	1	0	0	1
		5	1	JH	N E	3	2	0	1	3
		6	2	JH	S W	3	1	0	1	2
		7	2	JH	W	3	0	0	0	0
		8	2	JH	N W	3	1	0	0	1
		9	2	JH	S	10	0	0	0	0
		10	2	JH	N	10	0	0	0	0
		11	2	JH	S E	3	0	0	0	0
		12	2	JH	N E	3	0	0	0	0
IAP	Jacuzzi Flats	13	3	JF		3	16	0	0	16
		14	4	JF		3	5	0	0	5
		15	5	JF		3	6	0	0	6
		16	6	JF	S	10	2	0	0	2
		17	6	JF	N	3	3	0	0	3
		18	7	JF	S	3	2	1	0	3
		19	7	JF	N	3	1	0	0	1
		20	8	JF	S W	3	5	0	0	5
		21	8	JF	S E	3	3	0	0	3
		22	12	RF	N W	10	0	0	1	1
MD2	Rosie Hills	23	9	RH	S W 2	3	0	3	1	4
		24	9	RH	S W 1	10	13	0	0	13
		25	9	RH	W	3	5	0	4	9
		26	9	RH	N W 1	3	3	3	2	8
		27	9	RH	N W 2	3	0	0	0	0
		28	9	RH	S E 2	3	0	0	0	0
		29	9	RH	S E 1	3	0	0	0	0
		30	9	RH	E	3	0	0	0	0
		31	9	RH	N E 1	10	0	0	0	0
		32	9	RH	N E 2	3	2	0	0	2
IAP	Rosie Flats	33	9E	RF		3	1	0	0	1
		34	10	RF	S W	3	5	3	0	8
		35	10	RF	S E	3	0	1	3	4
		36	10	RF	N W	10	1	0	0	1
		37	10	RF	N E 1	3	3	0	0	3
		38	10	RF	N E 2	3	0	1	2	3
		39	11	RF		3	0	1	0	1
		40	12	RF	S W	3	0	0	1	1
		41	12	RF	S E	3	3	0	1	4
		42	12	RF	N W	10	0	0	0	0
IAP	Neroly Road	43		NR	N W 2	3	30	2	2	34
		44		NR	N W 1	3	35	0	6	41
		45		NR	S W 1	10	13	5	14	32
		46		NR	S W 2	3	12	1	6	19
		47		NR	S E 2	3	16	5	0	21
		48		NR	S E 1	3	12	5	1	18
		49		NR	N E 1	10	12	11	14	37
		50		NR	N E 2	3	20	16	4	40
		51		NR	N	3	13	1	2	16
		52		NR	S	3	9	4	4	17
MD2	Della Road	53		DR	W N E	3	0	0	0	0
		54		DR	W E	3	1	0	0	1
		55		DR	W S E	3	0	0	0	0
		56		DR	W N W	3	1	3	6	10
		57		DR	W W	10	0	1	1	2
		58		DR	W S W	3	0	3	0	3
		59		DR	E N E	3	3	2	2	7
		60		DR	E S W	10	1	3	3	7
IAP	Eden Plains	61		EP	E N W	3	16	0	0	16
		62		EP	E N E	3	24	0	0	24
		63		EP	E W	10	16	0	0	16
		64		EP	W S E	3	21	0	0	21
		65		EP		3	3	0	0	3
IAP	Airdrome	66		AD	W 2	3	5	0	0	5
		67		AD	W 1	3	6	0	0	6
		68		AD	E 1	10	9	0	0	9
		69		AD	E 2	3	2	0	0	2
IAP	Moffatt	70		MF	S W	3	0	7	5	12
		71		MF	N W	10	13	8	0	21
		72		MF	S E	3	16	5	1	22
		73		MF	N E	3	33	10	0	43
IAP	Lopez / Garrels	74		LZ	W	3	4	0	0	4
		75		LZ	N W	3	0	0	1	1
		76		LZ	N E	3	0	1	2	3
IAP	Chavez / Garrels	77		GL		3	0	0	2	2
IAP	Little Garrels	78		LG	N E	3	0	0	0	0
		79		LG	N W	10	0	0	1	1

Table 3. Summary of green apple (and similar aphid) damage and sprays and beneficial insect activity in the nine IAP orchards and the three orchards in their second year of pheromone mating disruption (MD)

IAP ORCHARDS	APHID ACTIVITY ¹	BENEFICIAL INSECT ACTIVITY ³									CONTROL ACTION
		Leaves showing predation	Leaves showing parasitization	Aphid fly larva	Lace wing	Lady beetle	Pirate bug	Midge larva	Big eyed bug	Damsel bug	
Jacuzzi Flats	2.3	95%	6%	12	7	7	4	1	0	0	Provado 7/13
Rosie Flats	2.2	98%	1%	60	110	5	7	0	0	0	Provado 7/16
Neroly Road	1.4	78%	0%	9	34	8	9	2	0	0	Provado 7/8
Eden Plains	0.8	57%	0%	2	29	1	7	0	1	0	none
Airdrome ²	2.3										Provado 6/24
Moffatt ²	1.4										Provado 6/23
3 Garrels Orchards	1.0	36%	3%	11	211	7	2	0	0	1	none
MD2 ORCHARDS											
Jacuzzi Hills	1.9	95%	9%	19	76	1	3	0	0	0	Provado 7/13
Rosie Hills	1.5	97%	1%	27	7	7	1	0	0	0	Provado 7/15
Delta Road	0.0	0%	1%	0	11	0	1	0	0	0	none

Notes:

- ¹ Rating: 3 = High (> 40 aphids/leaf) 2 = Moderate (10-40 aphids/leaf) 1 = Low (< 10 aphids/leaf). Evaluated 7/1 to 7/7
- ² Sprayed before evaluation; no active aphid population and no beneficial insect activity noted
- ³ Evaluated 7/1 to 7/7. Evaluation included field observations of 100 terminals/orchard (25 trees + 4 terminals/tree) and a laboratory exam of 1 leaf from each terminal showing aphid activity. Counts include the number of eggs, larva, or adults found in each category unless otherwise noted.

Table 4. Summary of tentiform leaf miner damage and sprays and parasite activity in the nine IAP orchards and the three orchards in their second year of pheromone mating disruption (MD)

IAP ORCHARDS	TENTIFORM LEAF MINER ACTIVITY ¹				CONTROL ACTION
	Mines/leaf	No. mines examined	Healthy TLM	Parasitized TLM	
Jacuzzi Flats	0.0	1	100%	0%	Agrimek 5/16 (preventative)
Rosie Flats	0.0	0			Agrimek 5/17 (preventative)
Neroly Road	2.5	26	81%	19%	none
Eden Plains	0.1	12	11%	1%	Asana 3/27 (preventative)
Airdrome	2.2	25	68%	32%	Vydate 8/14
Moffatt	0.0	2	50%	50%	Agrimek 5/7 (preventative)
3 Garrels Orchards	0.1	7	29%	71%	Agrimek 5/18 (preventative)
MD2 ORCHARDS					
Jacuzzi Hills	1.4	25	8%	92%	none
Rosie Hills	0.1	9	11%	89%	Agrimek 5/10 (preventative)
Delta Road	0.0	4	50%	50%	Asana 3/26 (preventative)

Notes: 1 Evaluated 7/1 to 7/7. Four mid shoot leaves were examined per tree from 25 trees in each orchard. Leaves with tent mines were bagged for laboratory examination to evaluate parasite activity. No more than 25 leaves were dissected per orchard.

Table 5. Summary of leaf hopper damage and sprays in the nine IAP orchards and the three orchards in their second year of pheromone mating disruption (MD)

IAP ORCHARDS	LEAFHOPPER ACTIVITY							CONTROL ACTION
	July Observations ¹				September Observations ²			
	Damage Rating	No. cast skins	No. live nymphs	No. live adults	Damage Rating	Live Nymphs	Live adults	
Jacuzzi Flats	0.1	16	0	0				none
Rosie Flats	0.0	0	0	0				none
Neroly Road	0.0	1	0	0				Pyramite 7/3
Eden Plains	0.5	45	33	2	L			Provado 8/11
Airdrome	0.0	0	7	2	H	H	H	none
Moffatt	0.1	3	3	0	L			none
3 Garrels Orchards	0.2	23	0	7	M	H	H	none
MD2 ORCHARDS								
Jacuzzi Hills	0.0	0	0	0				none
Rosie Hills	0.0	0	0	0				none
Delta Road	2.0	206	32	11	M	L	M	Pyramite 7/22

Notes:

¹ Evaluated 7/1 to 7/7. Four mid shoot leaves were examined per tree from 25 trees in each orchard:
 Rating: 3=moderate to heavy speckling over entire leaf
 2= light speckling over entire leaf or moderate speckling over part of leaf
 1= light speckling over part of leaf

² Informal evaluation during CM harvest
 High, medium, and low observations roughly correspond to the respective numerical 3,2,1 rating above.

Table 6. Overall summary of pest activity in the nine IAP orchards and the three orchards in their second year of pheromone mating disruption (MD)

PEST SUMMARIES											
IAP ORCHARDS	Codling Moth			Aphid		Leaf Hopper		Leaf Miner		Mites	Other
	1st	2nd	3rd	July		July	Sept	July		Sept	
	%	%	%	Pop'n Rating	Biological Control	Damage rating	Damage rating	mines/lf	Biological Control	Damage rating	
Jacuzzi Flats	0.0	0.2	0.0	MH	H	L	0	0	0%		
Rosie Flats	0.0	0.0	0.0	MH	H	0	0	0			LR,SB,scab
Neroly Road	0.7	2.6	0.8	ML	H	0	0	2.5	19%		LR,scab
Eden Plains	0.2	0.6	1.6	L	M	L	L	0.1	1%		SJS
Airdrome	0.0	0.0	0.0	MH		0	H	2.2	32%	H	B?
Moffatt	1.1	2.0	1.2	ML		L	L	0	50%		LR,PM,RAA, scab
3 Garrels Orchards	0.8	0.7	3.4	L	M	L	M	0.1	71%		scab, B?
MD2 ORCHARDS											
Jacuzzi Hills	0.0	0.0	0.3	M	H	0	0	1.4	92%	ML	WAA
Rosie Hills	0.0	1.3	2.9	ML	H	0	0	0.1	89%		
Delta Road	0.0	1.3	0.9	0	L	M	M	0	50%		scab, N
NOTES:				H=high M=medium L=low	H=high M=medium L=low	H=high M=medium L=low	H=high M=medium L=low	Threshold: 30%		LR=leaf roller SB=stink bug SJS=San Jose scale PM=powdery mildew RAA=rosy apple aphid WAA=wooly apple aphid B?=boron toxicity N=nitrogen deficiency	

Table 7. Summary of pest management applications in the nine IAP orchards, the three orchards in their second year of pheromone, and the three comparison orchards

IAP ORCHARDS	1999 SPRAYS APPLIED							
	Dormant	Thinning	Disease	Aphid	Leaf Miner	Mite	Leaf Hopper	Codling Moth
Jacuzzi Flats	1/11 Diazinon + oil		5/16 Rally	7/13 Provado	5/10 Agrimek	5/10 Agrimek 7/13 Kelthane		4/22 Isomate 350 5/16 Penncap full 7/15 Guthion edge 8/10 Isomate 240
Rosie Flats	1/11 Diazinon + oil	5/4 S+AT+R	5/17 Rally	7/16 Provado	5/10 Agrimek	5/17 Agrimek 7/16 Kelthane		4/22 Isomate 350 5/17 Penncap full 7/15 Guthion edge 8/11 Isomate 240
Neroly Road	1/13 Diazinon + oil	3/31 WT+R 4/25 S+AT+R	4/25 Rally/Topsin 5/17 Rally/Topsin 7/3 Rally	5/17 Diazinon 7/3 Provado		7/3 Pyramite		4/23 Isomate 400 5/17 Penncap-full-air 7/03 Guthion-edge 8/11 Isomate 400 8/20 Guthion-full-air
Eden Plains		4/17 S+AT+R	3/27 Topsin 4/17 Rally/AgriMy		3/27 Asana	8/11 Kelthane	8/11 Provado	4/17 Isomate 400 5/14 Penncap-full 8/11 Isomate 300
Airdrome	3/18 Diazinon + oil	4/16 S+AT+R 4/26 S+AT+R	4/16 Rally	6/24 Provado	8/14 Vydate	8/14 Kelthane		4/22 Isomate 350 5/6 Penncap-full 8/11 Isomate 240
Moffatt	3/22 Diazinon		3/22 Topsin 4/26 Rally	4/26 Diazinon 6/23 Provado	5/7 Agrimek	5/7 Agrimek 8/8 Kelthane		4/22 Isomate 400 5/7 Penncap-full 6/23 Guthion-edge 8/13 Isomate 400 8/28 Guthion-full
Little Garrels	1/13 Diazinon + oil		1/15 Kocide 4/18 Rally/Topsin					4/23 Isomate 350 5/11 Penncap-full 8/12 Isomate 240
Chavez Garrels	1/15 Diazinon + oil		4/17 Rally/Topsin 5/18 Rally/Topsin		5/18 Agrimek	5/18 Agrimek		4/23 Isomate 400 5/11 Penncap-full 8/12 Isomate 400
Lopez Garrels	1/15 Diazinon + oil		4/17 Rally/Topsin 5/18 Rally/Topsin		5/18 Agrimek	5/18 Agrimek		4/23 Isomate 400 5/11 Penncap-full 7/4 Guthion-edge 8/12 Isomate 400
MD2 ORCHARDS								
Jacuzzi Hills	1/11 Diazinon + oil	4/29 S+AT+R 5/10 S+AT+R	4/2 Rally	7/13 Provado		7/13 Kelthane		4/22 Isomate 350 5/10 Guthion edge 7/15 Guthion edge 8/10 Isomate 240
Rosie Hills	1/11 Diazinon + oil	4/28 S+AT+R	4/28 Rally	7/15 Provado	5/10 Agrimek	5/10 Agrimek 7/15 Kelthane		4/22 Isomate 350 5/10 Penncap full 7/15 Guthion edge 8/10 Isomate 240
Delta Road		4/16 S+AT+R	3/26 Topsin 4/16 Rally/AgriMy 5/17 Alliette		3/26 Asana	7/22 Pyramite	7/22 Pyramite	4/17 Isomate 340 5/17 Penncap-full 8/9 Isomate 300 8/15 Guthion-edge
COMPARISON ORCHARDS								
Geddes	1/15 Diazinon + oil		4/18 Rally/Topsin 5/11 Rally	6/29 Provado	5/11 Agrimek	5/11 Agrimek 8/13 Kelthane	8/13 Provado	5/11 Penncap 6/29 Guthion 8/13 Imidan
Home Apple	3/21 Diazinon		3/21 Topsin 4/26 Rally	4/26 Diazinon 6/24 Provado		8/8 Kelthane 9/1 Kelthane	8/11 Provado	5/7 Guthion 6/24 Guthion 8/8 Guthion
Lone Tree	1/12 Diazinon + oil	4/29 S+AT+R	5/17 Rally/Topsin	7/8 Provado			8/14 Provado	5/17 Penncap 7/8 Imidan 8/14 Guthion
ABBREVIATIONS:		S=Sevin AT=AmidThin R=Regulaid WT=Willthin	AgriMy=AgriMycin					

11/1999

Integrated Apple Production: Meeting the Challenge of the FQPA.

Janet Caprile¹ and Pat McKenzie²

The Integrated Apple Production (IAP) project began in 1999 as an effort to reduce the use of broad-spectrum insecticides in apple orchards by encouraging the use of proven, softer IPM practices. The impetus for the project was two fold: to help growers address the potential loss of pesticides posed by the implementation of the Food Quality Protection Act (FQPA) and to reduce pesticide spray and drift problems in rapidly urbanizing eastern Contra Costa County. The California Department of Pesticide Regulation (CDPR) provided a \$30,000 grant to support the transition to the reduced risk IAP approach.

Nine orchards (175 acres) participated in the IAP project in 1999. A management team comprised of participating growers, PCA's, field scout, and project coordinator met on a monthly basis to evaluate progress and problems. The key to the reduced risk IAP approach was the use of Mating Disruption (MD) to control codling moth (CM), the principal pest in apple production. A careful monitoring program was established to evaluate the need for supplemental CM controls: traps were set out at a rate of 3.5 traps/A and checked weekly. Fruit damage was evaluated at the end of each generation and at harvest. The CDPR funds were used to hire a part time field scout to assist with monitoring and provide a 50% cost share for the MD product to bring the cost of the IAP program closer to conventional costs. Three conventional orchards and 3 orchards in their 2nd year of MD were monitored as comparisons.

The IAP program increased the use of mating disruption in the county from 20 to 30% of the bearing apple acreage. In this first year, all orchards used a full rate of mating disruption and a full coverage organophosphate (OP) spray for the first generation. If monitoring indicated a need, orchards received an additional full coverage or border spray for later generations. Four orchards with the lightest pressure received no additional codling moth sprays and 5 orchards were able to reduce the rate of MD product in the later half of the season. CM damage averaged 1% in all the IAP orchards by season's end but ranged from 0 to 3.4% in individual orchards. OP sprays used for CM control were reduced by 60%.

Secondary pest outbreaks (aphid, leafhopper, mites, leaf miner) were expected due to the CM cover spray(s). Most orchards were able to successfully control these pests with narrow-spectrum materials (Provado, Agri-mek, Pyramite, Kelthane). By season's end, the IAP orchards had reduced all OP and carbamate (C) sprays by 26%; dormant and thinning sprays accounted for most of the OP/C use not related to CM.

Overall pest management costs for the first year IAP program were 28% higher than a conventional program (\$347/A vs. \$270/A). Without the IAP cost share, this reduced risk program would have been 62% higher (\$440/A). The 2nd year MD program cost 28% more than a conventional program (\$347/A) but would have cost about the same with an IAP cost share (\$264/A). In future years, as the codling moth population comes under control, orchards should be able to reduce costs by reducing the rate of MD product and sprays. Where supplemental CM sprays are needed, less disruptive materials (Confirm, Success) may be substituted for the broad-spectrum organophosphates. As broad-spectrum insecticides are eliminated, newly imported parasites (*Mastrus spp.*) will be released to assist with codling moth control and further reduce the need for supplemental sprays. Secondary pests are expected to be kept in check by cultural, biological or less disruptive chemical controls (Provado, Agri-mek, soaps, oil).

¹ Farm Advisor, UC Cooperative Extension, Contra Costa County, CA

² Pest Control Advisor, Wilbur-Ellis Co., Brentwood, CA.

CROP CURRENTS

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Pleasant Hill, CA 94523
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(925) 646-6708 FAX

From: Janet Caprile, Farm Advisor
jlcaprile@ucdavis.edu

724 Third St
Brentwood, CA 94513
(925) 634-3012

Office Hours: Mondays 1:30-4:30

Integrated Apple Production

*A practical workshop for growers and PCA's
on "reduced risk" pest management practices*

Monday, November 15

1:30-4:30 pm

Delta Community Services Center
730 Third Street
Brentwood

Codling Moth Management:

Mating disruption update: theory, practice, products, monitoring
Supplemental Sprays

Dr. Bob Van Steenwyk, Entomology Specialist, UC Berkeley

Reduced Risk Approaches for Other Pests:

What do we do about mites, aphid, scale, leafhopper, leaf miner

Dr. Walt Bentley, Entomology Advisor, UC Kearney Agricultural Center

Integrated Apple Production (IAP) Program and First Year Results

Funded by DPR to assist with the transition to a reduced risk pest management program in apples –
program overview, pest damage, costs, pesticide use.

Janet Caprile, Farm Advisor, Contra Costa County

Panel Discussion: Grower & PCA participants in the IAP program

Reduced Risk Pest Management Products "Trade Show"

*Please **RSVP** to the UC Cooperative Extension office in Pleasant Hill by November 12.*

3 hours of continuing education credit for Pest Control Advisors and Private Applicators pending.

CONTRA COSTA COUNTY DEPARTMENT OF AGRICULTURE PRESENTS:
1999
PRIVATE APPLICATOR
CONTINUING EDUCATION WORKSHOP

In the year 2000, individuals whose last names begin with R-Z will need to renew their private applicator certification card. You must have completed 6 hours of continuing education to do so. All private applicators are encouraged to attend. Each private applicator is required to complete 2 hours of continuing education each year to renew their certification card. Certification cards are valid for 3 years. If your last name begins with A-H, then your card will expire in the year 2001. At that time, A-H individuals must have 6 continuing education hours completed. Individuals with last names beginning with I-Q will have to renew their card in the year 2002 with 6 hours of continuing education completed. If you do not have the required hours when your card expires, then you will be required to take the state examination in our office before your permit can be issued to you.

There will be two classes offered. You only need to attend one. The classes are FREE.

Saturday December 4, 1999
8:30 a.m. – 12:00 p.m.

Thursday December 16, 1999
8:30 a.m. – 12:00 p.m.

DELTA COMMUNITY SERVICE CENTER-730 3RD ST. BRENTWOOD

This year's class will earn you 2 hours of laws and regulations and 1 hour of general pest management. The topics will be the same for both classes.

AGENDA FOR 1999 CONTINUING EDUCATION WORKSHOP

8:15-Registration and sign-in (Coffee & donuts)

Laws and Regulations

8:30-Common Use Report Mistakes-Speaker: Nancy Niemeyer.

8:45-Different Types of Respirators and Usage-Speaker: Harvard Fong; DPR (Worker Health & Safety Division)

9:30-break

9:45-Grower & Farm labor Contractor fieldworker requirements-Speaker: Jorge Vargas

10:00-Surface water protection

General Pest Management -presented by Janet Caprile U.C. Cooperative Extension Farm Advisor

10:45-11:30 Best Management Practices for Surface Water Protection

Pierces Disease on grapes

Updates on: Walnut Pest Management Alliance Project

~~Integrated Apple Production Project~~

Codling Moth Parasite Releases

Fallow Bed Weed Control before Sweet Corn

Individuals with last names that begin with R-Z should pre-register with our office ahead of time so that we may have your paperwork ready. Please call (925) 634-5682

This course is also good for continued education requirements of PCA's, QAL's, QAC's and Pilots.

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Brentwood, CA 94513
(925) 634-3012

Office Hours: Mondays 1:30-4:30

CALIFORNIA APPLE SYMPOSIUM

TUESDAY, FEBRUARY 22, 2000

Stockton Inn, Highway 99 and Waterloo Road, Stockton

Sponsored by Mid Valley Apple Association and UC Cooperative Extension

- 7:30 AM REGISTRATION AND COFFEE
- 8:00 **Chemical Thinning of Fuji and Pink Lady™**
Joe Grant, UC Farm Advisor, San Joaquin Co.
- 8:30 **Local Trials with Apogee® Plant Growth Regulator and Surround® Particle Films**
Kathy Kelley, UC Farm Advisor, Stanislaus Co.
- 8:55 **Evaluating Red Gala Strain for the Central Valley**
Janet Caprile, UC Farm Advisor, Contra Costa Co.
- 9:15 **Alternative Codling Moth Control Strategies**
Janet Caprile, UC Farm Advisor, Contra Costa Co.
- 9:45 **Glassy Winged Sharpshooter Update**
- 10:00 BREAK
- 10:15 **California Pesticide Impact Assessment Program as it Applies to Apples**
Rick Melincoe, US Department of Agriculture
- 10:45 **California Apple Commission Activities Update**
Kenton Kidd, California Apple Commission
- 11:15 **Fireblight Prediction Models and Research Report**
Brent Holtz, UC Farm Advisor, Madera Co.
- 12:00 PM LUNCH AND LUNCHEON SPEAKER:
What Produce Buyers Look for When Purchasing Apples
Steve Janquero, Director of Produce, Save-Mart Supermarkets
Diamond Apple Award Presentation

DPR Continuing Education Credit: 2.5 Other, 0.5 Laws & Regulations

California Apple Symposium Luncheon Reservations – send by Feb 18, 2000 to:
MVAA, 6001 Maze Boulevard, Modesto, CA 95358

Name: _____ \$ _____ 2000 Membership Dues, \$35

Address: _____ \$ _____ MVAA Member Lunch, \$7

_____ \$ _____ Non-Member Lunch, \$12

_____ \$ _____ TOTAL

Agenda

Pomology Extension Continuing Conference (PECC)

March 23-24, 2000

Rec Pool Lodge, UC Davis

Thursday, March 23

8:00 A.M. Registration and Continental breakfast

9:00 Welcome to PECC 2000, Acknowledgements and Introductions
Kirk Larson

UCCE Organizational Structure for the New Millennium
Moderators: Kirk Larson

9:10 DANR Reorganization and the Role of Workgroups
Lanny Lund, Assistant Vice President, UC DANR

9:50 Questions and Discussion

10:20 Break

10:40 Development of an Operational Framework for PECC
(a *Coordinating* Conference)
Round table discussion – Ted DeJong, moderator

Cooperative Extension and Production Horticulture in the New Millennium
Moderators: Kirk Larson

11:15 DNA for Reinventing Agriculture
Len Richardson, Editor, California Farmer Magazine

12:00 Working Lunch - State of the Department Address
Pomology Dept. Chair, Ted DeJong

Agenda

Pomology Extension Continuing Conference (PECC)

March 23-24, 2000

Rec Pool Lodge, UC Davis

Thursday, March 23



12:45 P.M. Economic Considerations in Organic Fruit Production
Karen Klonsky

1:30 Issues in Reduced Risk Fruit Production
Janet Caprile – apples
Walt Bentley - stone fruit, almonds
Carolyn Pickel – walnuts
Bill Olson – prunes

3:15 Adjourn to Wolfskill Experimental Orchard (carpool caravan)

4:00 Tour of Wolfskill Experimental Orchard
Tour leader: Ted DeJong
cherries: Steve Southwick
peach, almond breeding: Tom Gradziel
pistachio breeding: Dan Parfitt
strawberry breeding and production: Doug Shaw, John Hansen
walnut breeding: Gale McGranahan

5:30 Pomology Social
Wolfskill Experimental Orchard (under the trees, weather permitting)

7:00 Dinner
Buckhorn Steak and Roadhouse
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Winters
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APPLES
& PEARS

New Millennium Apple Pest Management

By Janet Caprile

California growers are facing the loss of some of their traditional pest management materials due to new and upcoming regulatory actions. Apple growers will be entering the new millennium without use of Penncap and with an extended re-entry interval for Guthion. Lorsban and Diazinon are under scrutiny and may face more stringent use restrictions if levels in surface water do not decrease. Additional restrictions are expected in the near future for organophosphates (OP) and carbamates due to the Food Quality Protection Act (FQPA). In

Janet Caprile is a U.C. Cooperative Extension farm advisor in Contra Costa County

view of these potential losses, it seems prudent to gain some experience with alternatives to these targeted materials.

Codling moth is the most important pest of apples. Luckily there are a number of alternatives to the traditional OP control materials. Perhaps the most proven approach has been mating disruption, widely adopted in the Northwest. The method is most effective on large, flat, squarish blocks with low codling moth pressure. Since our growing season is longer and our codling moth pressure is greater, this approach has not been as widely adopted in California. However, it has been used enough to know it work here; it simply requires an additional product application to last through our longer season.

It is typically used in conjunction with traditional insecticides, especially in the first few years, to reduce the overall codling moth pressure as well as provide supplemental control along problem edges or hilltops. As the codling moth pressure diminishes over time, fewer supplemental sprays are needed and it should be possible to transition from OP's to softer, "reduced-risk" materials like Confirm (pending California registration) or Success. These softer mate-

rials can even be effective on their own under low pressure conditions.

The main drawbacks to mating disruption has been the increased cost and monitoring required, especially in the first few years. Once the codling moth pressure declines, growers have been successful in reducing both the rate of MD and the number of sprays which brings the cost closer to that of our traditional programs.

There are some new, improved pheromone products which should enhance cost effectiveness. Many of the established mating disruption products like Isomate, Checkmate, and Disrupt CM have been improved so they last longer than earlier formulations. A new mating disruption dispenser, the Paramount Aerosol Pheromone Dispenser lasts all season and should be available from Paramount Farming Company next season.

Last Call (known as Sirene in Europe) is a new type of pheromone product which should also be available next season. It uses pheromone in a completely different way from the mating disruption products. Instead of large amounts of pheromone to disrupt mating, this product uses just enough pheromone to attract male moths to a drop of insecticide which kills them. The "attract and kill" approach should be more effective than mating disruption on smaller orchards.

There are a number of other pests that can be problematic in apple orchards. Once the broad spectrum materials for CM are reduced or eliminated, biological control for some of the secondary pests like leaf miner, mites, scale, aphid and leafhopper should increase and may eventually be able to keep these pests below an economic threshold.

A dormant or delayed dormant oil spray (without an insecticide) will help to reduce these pests and encourage in-season biological control. If in-season sprays are needed, less disruptive materials like Provado (for aphid and leafhoppers), Agrimek (for leaf miners and mites) and oil (for mites) can effectively control these pests while preserving beneficials.

Other pests like leaf rollers that were kept in check by the codling moth sprays may become more problematic when these materials are withdrawn. Fortunately, alternative materials like BT, Success, and Confirm can effectively replace these broad spectrum materials without disturbing the biological control for the other secondary pests. **CG**

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Integrated Apple Production: Meeting the Challenge of the FQPA

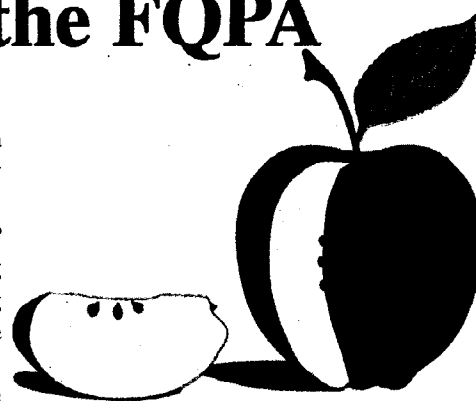
By Janet Caprile and Pat McKenzie

The Integrated Apple Production (IAP) project began in 1999 as an effort to reduce the use of broad spectrum insecticides in apple orchards by encouraging the use of proven, softer IPM practices. The impetus for the project was twofold: 1) To help growers address the potential loss of pesticides posed by the implementation of the Food Quality Protection Act (FQPA); and 2) to reduce pesticide spray and drift problems in rapidly urbanizing eastern Contra Costa County. The California Department of Pesticide Regulation (CDPR) provided a \$30,000 grant to support the transition to the reduced risk IAP approach.

Nine orchards (175 acres) participated in the IAP project in 1999. A management team comprised of participat-

ing growers, PCA's, a field scout, and a project coordinator met on a monthly basis to evaluate progress and problems. The key to the reduced risk IAP approach was the use of Mating Disruption (MD) to control codling moth (CM), the principal pest in apple production.

A careful monitoring program was established to evaluate the need for supplemental CM controls. Traps were set out at a rate of 3.5 traps per acre and checked weekly. Fruit damage was evaluated at the end of each generation and at harvest. The CDPR funds were used to hire a part-time field scout to assist with monitoring and to provide a 50 percent cost share for the MD product to bring the cost of the IAP program closer to conventional costs. Three conventional orchards and three orchards in their



second year of MD were monitored as comparisons.

The IAP program increased the use of mating disruption in the county from 20 percent to 30 percent of the bearing apple acreage. In this first year, all orchards used a full rate of mating disruption and a full coverage organophosphate (OP) spray for the first generation. If monitoring indicated a need, orchards received an additional full coverage or border spray for later generations. Four

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By James H. Hughes

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Girdling Pear Trees to Control Vigor – UC Farm Advisor Chuck Ingels discusses several different methods for girdling pear trees in an attempt to increase yields, improve set, increase fruit size, and/or advance maturity. Read the results of his girdling trial and decide if this method might work for you.

By Chuck Ingels

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Integrated Apple Production and the FQPA – Discover the results of a project designed to help growers facing the potential loss of pesticides from the FQPA. Read how the use of mating disruption reduced the usage of organophosphate sprays.

By Janet Caprile and Pat McKenzie

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